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CONVERTIBLE VEHICLE

The invention concerns a convertible vehicle with a movable roof, which has a flexible roof covering at least in its rear area, in accordance with the introductory clause of Claim 1.

A convertible vehicle with a completely or partially flexible roof covering, e.g., a vinyl or textile roof covering, often has, provided that the rear end region of the roof covering is not secured to the vehicle body, a rear tension bow, by which the roof covering can be stretched on a body section on which it rests when the roof is closed. In this regard, it is well known that the tension bow is U-shaped as viewed from above and has a middle section that extends transversely to the vehicle and lateral legs that extend essentially in the longitudinal direction of the vehicle. To allow mobility, for example, rotatability, of the tension bow for opening the roof, it is necessary for a section of the roof covering located in front of the lateral legs of the tension bow with respect to the direction of vehicle travel to be elastically movable and

especially foldable during the opening of the tension bow. Therefore, the lateral legs of the tension bow cannot extend, securely connected to the roof covering, as far as, say, a pivot axis of the tension bow, but rather must leave an open section for the movement of the section of the roof covering. Nevertheless, when the roof is closed, this section of the roof covering must rest securely and with a good seal on the automobile body.

The objective of the invention is to improve a convertible vehicle of the aforementioned type with respect to the sealing contact of lateral sections of a flexible roof covering.

The invention achieves this objective with a convertible vehicle with the features of Claim 1. Advantageous refinements of the object of the invention are described in dependent Claims 2 to 10.

The invention creates additional tensioning means for the flexible roof covering or section of roof covering besides the rigid tension bow. This improves its sealing contact with the automobile body when the roof is closed. Since, in contrast to the tension bow, the additional tensioning device is not completely rigid, it can adjust to the folding movement of the roof covering during the movement of the roof or in the lowered state of the roof.

In this regard, a tensioning device that passes over both sides of the vehicle can be provided, which, e.g., passes through the tension bow, or, in a simple design, exactly one tensioning device can be assigned to each longitudinal side of the vehicle.

If the tensioning device(s) each follow a sealing line that lies in the lower marginal region of the roof, and in the tensioning position they act on this sealing line with a force that presses against a region of the automobile body that serves as a support, then improvement of the contact of the entire sealing line can be achieved along a line and not just pointwise.

Additional improvement of the seal is obtained if the support is curved convexly upward.

In this regard, it is advantageous with respect to improvement of the linear contact for the tensioning device(s) to lie at least partially within sealing lines formed by elastic profiles.

In an especially advantageous design of the invention, the flexible tensioning device or each flexible tensioning device has the dual function of applying not only downward pressure on a region laid out on the automobile body but also a tensile force on lateral roof regions in such a way that their

tensioning with respect to side windows is improved by reduction of the material slack.

In a simple design of a flexible tensioning device, the device consists of a traction cable with a spring element. To ensure the aforementioned dual function, the traction cable can extend, e.g., over a large region of the sideline of the roof from a roof tip to a rear tension bow.

Further advantages and features of the invention are explained below with reference to the specific embodiment of the object of the invention that is illustrated in the drawings.

-- Figure 1 shows a schematic side view of an upper region of a convertible vehicle of the invention with the roof closed, shown without the roof covering for the sake of clarity.

-- Figure 2 shows a view similar to that of Figure 1 but with the roof covering shown.

-- Figure 3 shows the roof according to Figure 1 without the roof covering, with the roof tip raised, with the rear tension bow swung slightly upward, and with the flexible tensioning device relaxed.

-- Figure 4 shows the detail IV in Figure 1.

-- Figure 5 shows a section along line V-V in Figure 4 with a weatherstrip additionally shown.

-- Figure 6 shows a view, similar to that of Figure 5, of

an alternatively arranged traction cable laid above the sealing profile.

The convertible vehicle 1, only the upper region of which is shown schematically in Figure 1, has a movable roof 2, which has a movable linkage that is labeled here as a whole with reference number 3. The movable linkage 3 is completely covered by a roof covering 4 (not shown in Figure 1). Alternatively, it is also possible to provide a flexible roof covering only in the rear section of the roof 2, and for the front section of the roof 2 with respect to the direction of vehicle travel F to have one or more rigid outer skin sections. The roof 2 can be opened by lowering it as a whole into the automobile body 5.

In the illustrated embodiment, in the closed state of the roof 2, the rear section 6 of the roof 2 rests on an openable cover part 7.

In this region 6, the roof linkage 3 includes a rear tension bow 8, which is horizontally situated when the roof 2 is closed, and in this position rests on the cover part 7. The roof covering 4 is connected to the tension bow 8. The tension bow 8 is U-shaped as viewed from above and comprises a middle section that extends transversely to the vehicle 1 and lateral legs 9 that extend essentially in the direction of vehicle travel F. The tension bow 8 can be swung upward about a fixed

horizontal axis 10 or, as illustrated here, about a horizontal axis 10 that can move with a rear lateral frame part 15c out of the tensioned position illustrated in Figure 1, in which the roof covering 4 is tensioned by the lowered tension bow 8, into a position in which the tension on the roof covering 4 is released.

In front of the lateral legs 9 with respect to the direction of vehicle travel F, there is a region 11 of the roof covering 4, the lower edge of which forms a sealing line 12 that extends each lateral leg 9 towards the front with respect to the direction of vehicle travel F, e.g., by means of a rubber elastic hollow section. When the roof is closed (Figure 1, Figure 2), this is intended to produce tight contact between the roof covering 4 and the section of the automobile body 5 on which it rests, for example, the cover part 7. The region 11 that extends freely at its lower edge without support by the tension bow can be a few centimeters to a few tens of centimeters long and can be elastically deformed and folded in to a greater or lesser extent to open the roof 2.

In accordance with the invention, at least one flexible tensioning device 13 is provided to ensure and improve the contact of the sealing line 12 on the automobile body 5 when the roof 2 is closed. Exactly one tensioning device 13 is

constructed here on each longitudinal side of the vehicle. Each tensioning device 13 comprises at least one steel cable with a tension spring 14, which, in the present case, is placed between two sections of the steel cable 13 but could also be located at an articulation of the cable 13. The rear end of the cable 13 with respect to the direction of vehicle travel F is articulated with the lateral leg 9 of the tension bow 8, and the front end of the cable 13 is articulated with a front lateral frame part 15a, which is rigidly connected with the roof tip 16. In the closed position of the roof 2, the roof tip 16 (Figure 1) is locked on a front windshield frame 17.

In this position, the tensioning device 13 experiences its maximum tensile load, so that the section 19 of the tensioning device 13 that is located in the region 11 of the roof covering and that runs essentially horizontally due to the deflection 18 tries to run in a line that is as straight as possible. As a result, the tensioning device 13 exerts a force that acts in the direction of arrow 20 on the sealing line 12 and presses the sealing line 12 into a position in which it is tightly stretched on the automobile body 5. In particular, this action can be supported by providing a support 21 of the automobile body 5 that projects slightly convexly upward. This support 21 also assists the flexure of the steel cable 13 in the direction of

arrow 22 when the roof tip 16 is raised.

As a result of the fact that each tensioning device 13 extends between the front lateral frame part 15a and the tension bow 8, the tensioning device 13 is able to carry out its dual function of not only acting on the roof covering 4 in region 11 but also of tightening a region of material slack located farther forward on the lateral frame parts 15a, 15b, 15c relative to side windows of the vehicle 1 and is thus able to improve the seal in this area, too, and to minimize wind noise.

At the same time, this course of the tensioning device 13 also ensures that when the roof tip 16 is raised, the tensioning device 13 is immediately relaxed to enable the region 11 to fold in (Figure 3).

Figure 4 shows detail of the course of section 19 of the traction cable 13 immediately in front of the lateral legs 9 of the tension bow 8. The cable 13 is tightened by tensile force when the roof tip is closed, and at the same time, it presses the seal 12 (not shown in Figure 4) downward in the direction of arrow 20. Conversely, when the roof tip is released (Figure 3), the release of the tension allows the cable 13 to bend in the direction of arrow 22, so that the tension bow 8 can swing upward, and the cover part located beneath it obtains sufficient clearance for it to be opened. The roof 2 can then be lowered

into the automobile body.

The manner in which the flexible traction cable 13 is laid (Figure 5) results in an arrangement of the steel cable 13 that provides protection against external wear. The linear application of pressure on the seal 12 can be especially well ensured.

The cable 13 can also be laid above the seal 12, e.g., in a holding groove 23 formed in the seal. This facilitates the laying of the tensioning device 13.

Instead of a traction cable, other flexible and elastically deformable elements can be provided for the tensioning device 13, e.g., a leaf spring or other type of spring. It is also possible that the movement of the tensioning device could require an additional drive element, and that the tensioning device is not automatically tightened and released, as in the present case, by the movement of the roof.